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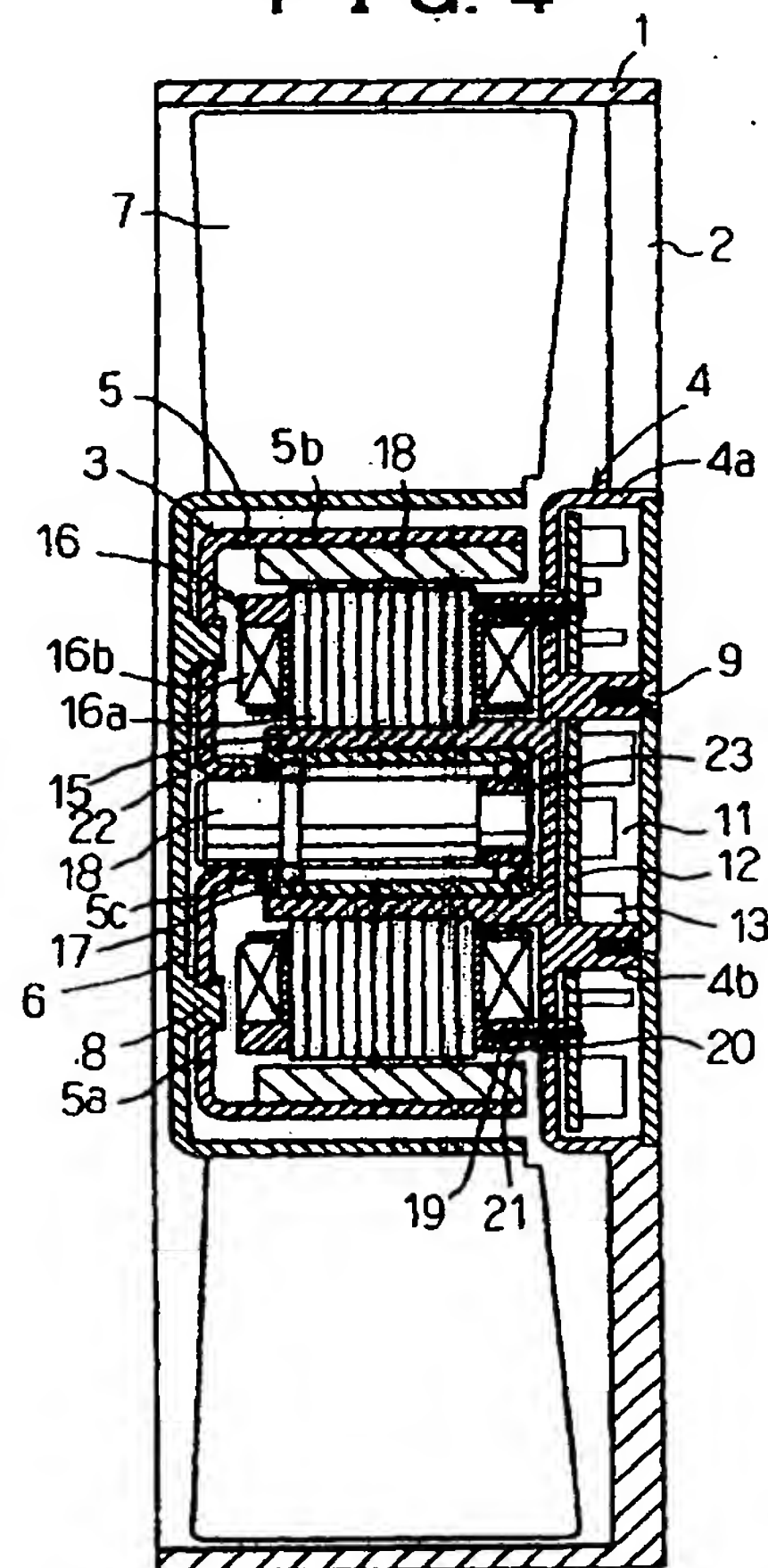
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(54) **Blower**

(57) A blower suitable for office automation equipment comprising a motor with an impeller (6) mounted by stays (2) in a frame (1). The motor has a base (4) with a flange (4a) extending away from bearing, coil and magnet (18) components of the motor to form a chamber (11) which accommodates a printed circuit board (12) supporting electrical components (13). A chamber opening, defined by the flange (4a), is sealed closed by a cover (10) held in place by screws (9) which engage bosses (4b) projecting from the base (4). Airborne contaminants which could cause electrical component degradation are thereby prevented from contacting the printed circuit board (12) and electrical components (13) thus increasing the life and reliability of the blower.

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EP 1 150 017 A2

Description

[0001] The present invention relates mainly to a blower suitable for cooling office automation equipment.

[0002] A typical blower for cooling office automation equipment has for example a structure as shown in Fig. 5 in which the blower includes a base 33 provided and supported at the central portion of a frame 31 by means of stays 32, a rotor member 35 rotatably journalled by means of a bearing apparatus 34 provided on the front side of the base at the central portion thereof, and an impeller 37 having a plurality of blades 36 provided on an outer peripheral flange 37a, the impeller is mounted on the rotor member 35.

[0003] A printed circuit board 39 including electrical components 38 for controlling the motor is secured to an iron core holder 40a of a stator 40 by means of screws 41, and is accommodated within a parts storing portion 42 surrounded by a flange 33a extending forward from the outer periphery of the base 33.

[0004] The reference numeral 43 designates a magnet or magnets mounted on the inner surface of the outer peripheral flange of the rotor member 35 so as to be opposite the outer peripheral surface of the stator.

[0005] In the above described blower, the impeller 37 will rotate upon energizing of the motor, and at least a portion of thus produced wind penetrates through a clearance A defined between a rear end edge of the outer peripheral flange 37a of the impeller 37 and a front end edge of the outer peripheral flange 33a of the base 33 into the motor.

[0006] This leads to a disadvantage that moisture, dirt, dust or other harmful gas or substances contained in the air penetrate into the base of the motor and impair the insulating property of the electrical components such as printed circuit board 39 or electronic parts 38, i.e. the electrical insulation or dielectric properties of these components becomes impaired.

[0007] Accordingly the object of the present invention is to provide a blower in which electrical components such as printed circuit board or electronic parts are isolated from the air flowing through the blower to protect these components from moisture, dirt, dust or other harmful gas or substances contained in the air, and to prevent the degradation of the insulating property such as the electric insulation or dielectric strength of these components.

[0008] These and other objects are achieved by a blower having an impeller adapted to be rotated by means of a motor in accordance with claim 1, the blower comprising:

a base for supporting the motor, the base is provided and supported at the central portion of a frame by means of stays; and
a chamber for accommodating electrical components formed in the base, the back portion of the chamber adapted to be sealed by a removable cov-

er.

[0009] The blower in accordance with claim 2 has an impeller adapted to be rotated by means of a motor, the blower comprising:

a base for supporting the motor, the base is provided and supported at the central portion of a frame by means of stays;
a bearing apparatus for supporting a central portion of the impeller, the bearing apparatus including:

a sleeve, a stepped shaft including a larger diameter portion and a reduced diameter portion, a first raceway formed at an appropriate position around an outer peripheral surface of the larger diameter portion, a second raceway formed on an inner peripheral surface of the sleeve so as to correspond with the first raceway, a first row of balls interposed between the first and second raceways, an inner ring fitted over the reduced diameter portion of the shaft and secured thereto, a third raceway formed around an outer peripheral surface of the inner ring, the fourth raceway formed on the inner peripheral surface of the sleeve so as to correspond with the third raceway, a second row of the balls interposed between the third and fourth raceways, and
a chamber for accommodating electrical components formed in the base, the back portion of the chamber adapted to be sealed by a removable cover, and
the balls of the first and the second rows of the bearing apparatus are made of ceramic material.

[0010] The chamber for accommodating electrical components is formed by the base having a flange extending backwards from the outer periphery thereof to form a cylindrical body with a bottom, the chamber has an opening at the rear thereof, and the rear opening of the base is occluded or covered by the cover which is detachably mounted by screws on the base.

[0011] An embodiment of the invention will be described by way of example only.

[0012] Further features of the present invention will become apparent to those skilled in the art to which the present invention relates from reading the following specification with reference to the accompanying drawings in which:

FIG. 1 is an elevational view showing the blower in accordance with the present invention;
FIG. 2 is a rear elevation showing the blower in accordance with the present invention;
FIG. 3 is a longitudinal cross sectional view showing the blower in accordance with the present invention;

FIG. 4 is a longitudinal cross sectional view showing one example of the blower in accordance with the present invention equipped with a motor of an outer rotor type; and

FIG. 5 is a longitudinal cross sectional view showing the blower of the prior art.

[0013] An embodiment of the blower in accordance with the present invention will now be described in detail with reference to the example thereof illustrated in the attached drawings.

[0014] A blower body or a frame 1 of synthetic resin includes a base 4 supported integrally therewith at the central portion thereof through a few stays 2. A motor 3 is mounted on the front side of the base 4.

[0015] A distal end of a spindle shaft 3a of the motor 3 is fitted and secured in a central hub 6c protruding backwards from a front face plate 6a of an impeller 6. The impeller 6 includes the front face plate 6a, a flange 6b extending backwards from the outer periphery of the plate, and a suitable number of blades 7 provided around the outer periphery of the flange.

[0016] The base 4 has a flange 4a extending backwards from the outer periphery thereof to form a cylindrical body with a bottom having an opening at the rear end thereof. The cylindrical body is covered by a cover 10 to define a sealed chamber 11 for accommodating electric components. The accommodating chamber is adapted to accommodate the electrical components such as the printed circuit board 12 or other electronic parts 13.

[0017] A plurality of internally threaded bosses 4b extend backwards (rightwards in the drawings) from the bottom of the base 4 to detachably mount the cover 10 to the base by threadably engaging screws 9 with the internal threads of the bosses.

[0018] The reference numeral 14 designates leads to a printed circuit board, and the reference numeral 14a designates a connector of the leads 14.

[0019] Motors of various structures can be employed for the above described blower. An example of the blower including a motor of an outer rotor type is shown in Fig. 4.

[0020] The base 4 has a sleeve-like bearing holder 15 formed integrally therewith extending forwards (leftwards in the drawings) therefrom. The bearing holder 15 is provided therearound with a stator 16 comprising an iron core 16a and a coil 16b. Further, a sleeve 17 forming an outer ring is accommodated within the bearing holder 15.

[0021] The sleeve 17 includes a spindle shaft 18 journaled by means of a bearing apparatus as described hereinbelow. A distal end of the spindle shaft protruding from the sleeve 17 fits within a hub 5c extending from a central aperture formed on a front face plate 5a of a yoke 5 and is secured thereto.

[0022] The yoke 5 has a flange 5b extending backwards from the outer periphery of the front face plate 5a.

A magnet or magnets 18 corresponding to the stator 16 are provided on the inner peripheral surface of the flange. An impeller 6 is secured to the front face plate 5a of the rotor member 5 by means of rivets 8 or any other means.

[0023] A lead wire 19 leading to the coil 16b of the stator 16 extends through a bore formed through a leg 21 of an iron core holder 20 of the stator to the circuit formed on the printed circuit board 12 and connected thereto.

[0024] The reference numeral 22 designates a washer of synthetic resin mounted around the spindle shaft 18 for preventing the dirt or dust from entering into the bearing apparatus.

[0025] A bearing apparatus of various structures can be adopted for journaling the spindle shaft 18. The bearing apparatus of this embodiment comprises a stepped shaft 18 including a larger diameter portion and a reduced diameter portion, an inner ring 23 fitted to and secured over the reduced diameter portion of the shaft, a first raceway formed around the outer periphery of the larger diameter portion, a second raceway formed on the inner peripheral surface of the sleeve 17, a plurality of balls of metallic or ceramic material of a first row interposed between the first and second raceways, a third raceway formed around the outer periphery of the inner ring 23, a fourth raceway formed on the inner peripheral surface of the sleeve, and a plurality of balls of metallic or ceramic material of a second row interposed between the third and fourth raceways.

[0026] The balls of the first and second row are equal in their diameter. The balls of ceramic material have high hardness, and provide good wear resistance and durability.

[0027] A blower including a bearing apparatus in which balls of ceramic material are incorporated can be used at high rotation speeds and can be operated relatively quietly.

[0028] A blower in accordance with the present invention is provided at the rear side of the base with a chamber for accommodating electrical components so that the printed circuit board or electronic parts can be protected from moisture, dirt, dust or other harmful gas or substances contained in a draught produced through the wind tunnel portion, and the degradation of the insulating property such as the electric insulation or dielectric property can be avoided. Thus, the reliability of the blower or the equipment incorporated within the blower can be enhanced.

[0029] The blower claimed in claim 2 is provided with the bearing apparatus including a stepped shaft having a raceway which is formed directly on the larger diameter portion thereof. Thus a conventional ball bearing including both inner and outer rings is not necessary, and the diameter of the larger diameter portion of the shaft can be enlarged by the sum of the thicknesses of the inner and outer rings of the ball bearing, and the diameter of the reduced diameter portion of the shaft can

also be enlarged by the thickness of the outer ring of the ball bearing, i.e. a generally thicker shaft can be used.

[0030] Accordingly, a blower including a shaft of higher rigidity, good durability, lower rotational run-out or play, and quiet operation can be provided.

[0031] Further, the bearing apparatus includes one sleeve serving as outer rings and one inner ring fitted around the reduced diameter portion of the spindle shaft, so that the number of components of the bearing apparatus can be reduced to decrease the cost thereof.

[0032] While a particular embodiment of the present invention has been illustrated and described, it should be obvious to those skilled in the art that various changes and modifications can be made without departing from the scope of the invention.

Claims

1. A blower having an impeller (6) adapted to be rotated by means of a motor (3) comprising:

a base (4) for supporting the motor (3), the base (4) is provided and supported at the central portion of a frame (1) by means of stays (2); and
a chamber (11) for accommodating electrical components (12, 13) formed in the base (4), a back portion of the chamber (11) adapted to be sealed by a removable cover (10).

2. A blower having an impeller (6) adapted to be rotated by means of a motor (2) comprising:

a base (4) for supporting the motor (3), the base (4) is provided and supported at the central portion of a frame (1) by means of stays (2);
a bearing apparatus for supporting a central portion of the impeller (6), the bearing apparatus including
a sleeve (17),
a stepped shaft (18) including a larger diameter portion and a reduced diameter portion,
a first raceway formed at an appropriate position around an outer peripheral surface of the larger diameter portion,
a second raceway formed on an inner peripheral surface of the sleeve (17) so as to correspond with the first raceway,
a first row of balls interposed between the first and second raceways,
an inner ring fitted over the reduced diameter portion of the shaft and secured thereto,
a third raceway formed around an outer peripheral surface of the inner ring,
a fourth raceway formed on the inner peripheral surface of the sleeve (17) so as to correspond with the third raceway,
a second row of balls interposed between the

third and fourth raceways, and
a chamber (11) for accommodating electrical components (12, 13) formed in the base (4), a back portion of the chamber (11) adapted to be sealed by a removable cover (10).

3. A blower according to claim 1 wherein the chamber (11) for accommodating electrical components (12, 13) is formed by the base (4) having a flange (4a) extending backwards from an outer periphery thereof to form a cylindrical body with a bottom, the chamber (11) having an opening at the rear thereof, and the rear opening of the base (4) being covered by the cover (10) detachably mounted by screws (9) on the base (4).
4. A blower according to claim 2 wherein the chamber (11) for accommodating electrical components (12, 13) is formed by the base (4) having a flange (4a) extending backwards from an outer periphery thereof to form a cylindrical body with a bottom, the chamber (11) having an opening at the rear thereof, and the rear opening of the base (4) being covered by the cover (10) detachably mounted by screws (9) on the base (4).
5. A blower according to claim 2 wherein the balls of the first and second rows of the bearing apparatus are made of ceramic material.

FIG. 1

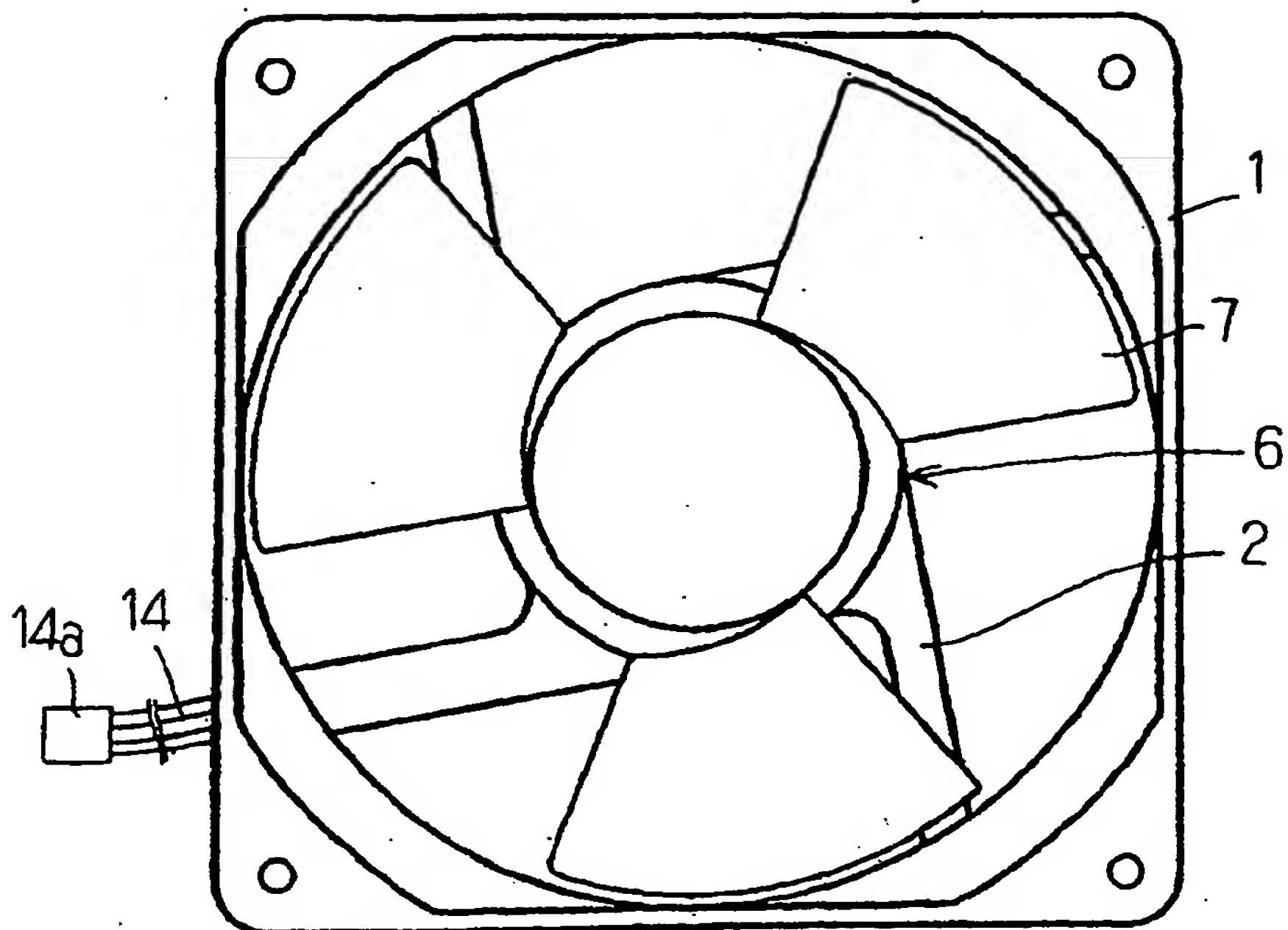


FIG. 2

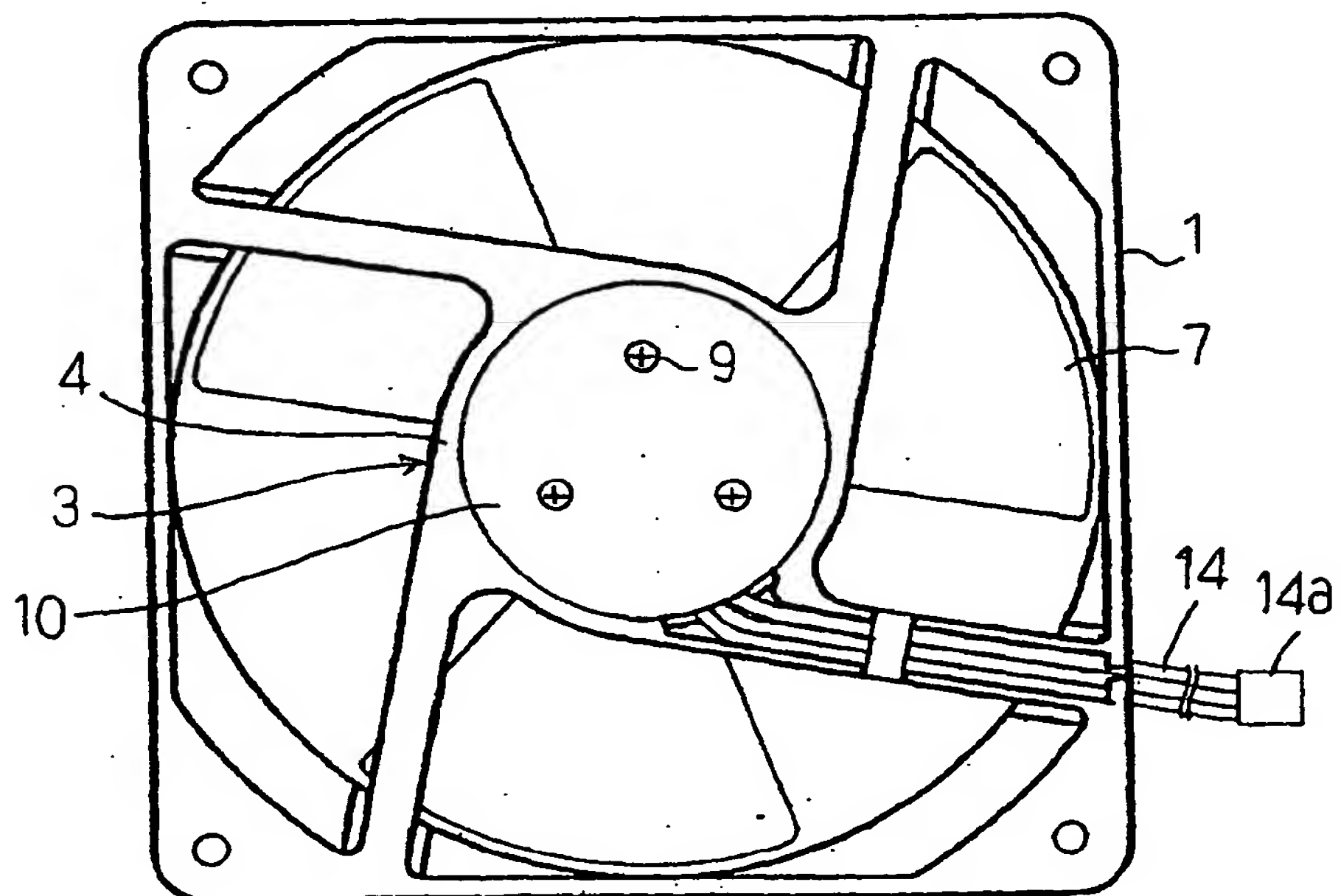


FIG. 3

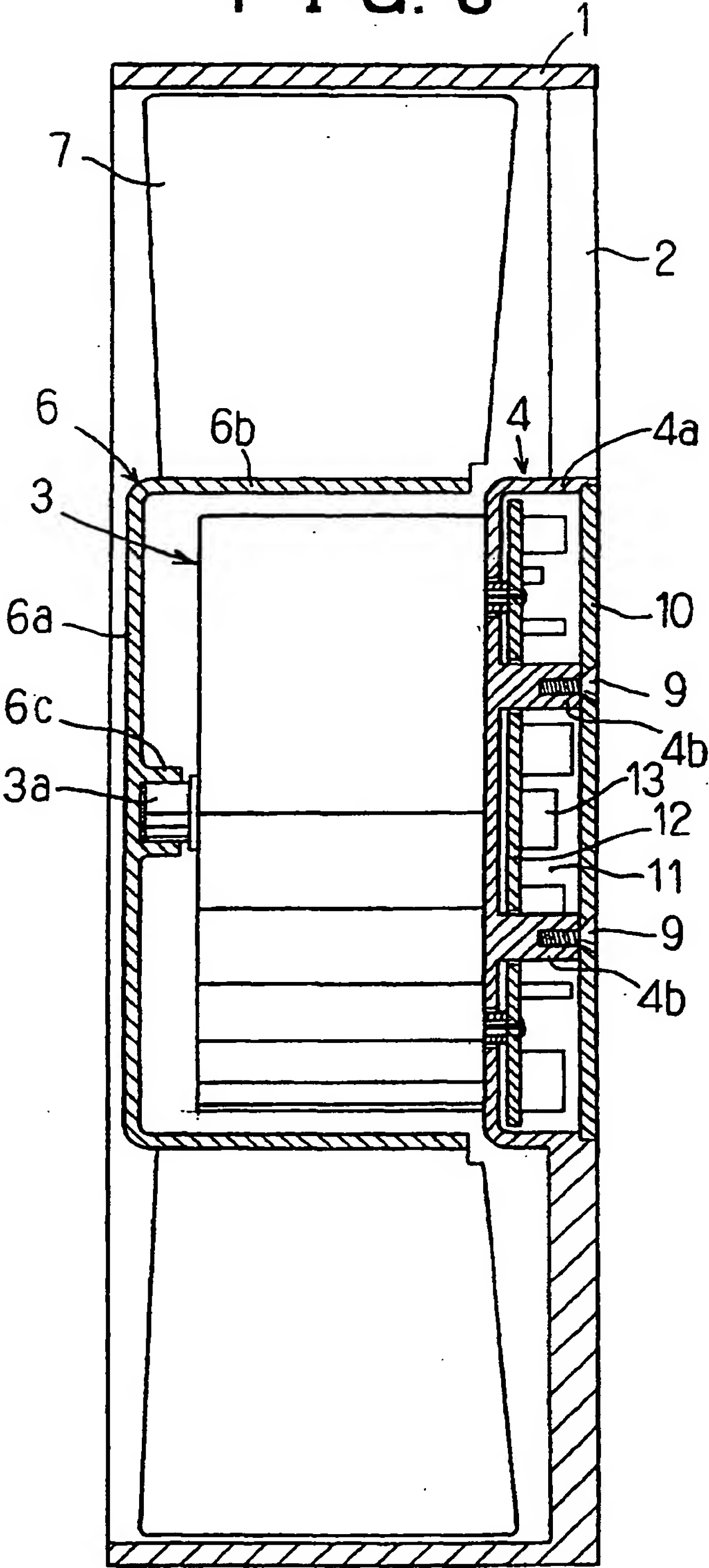


FIG. 4

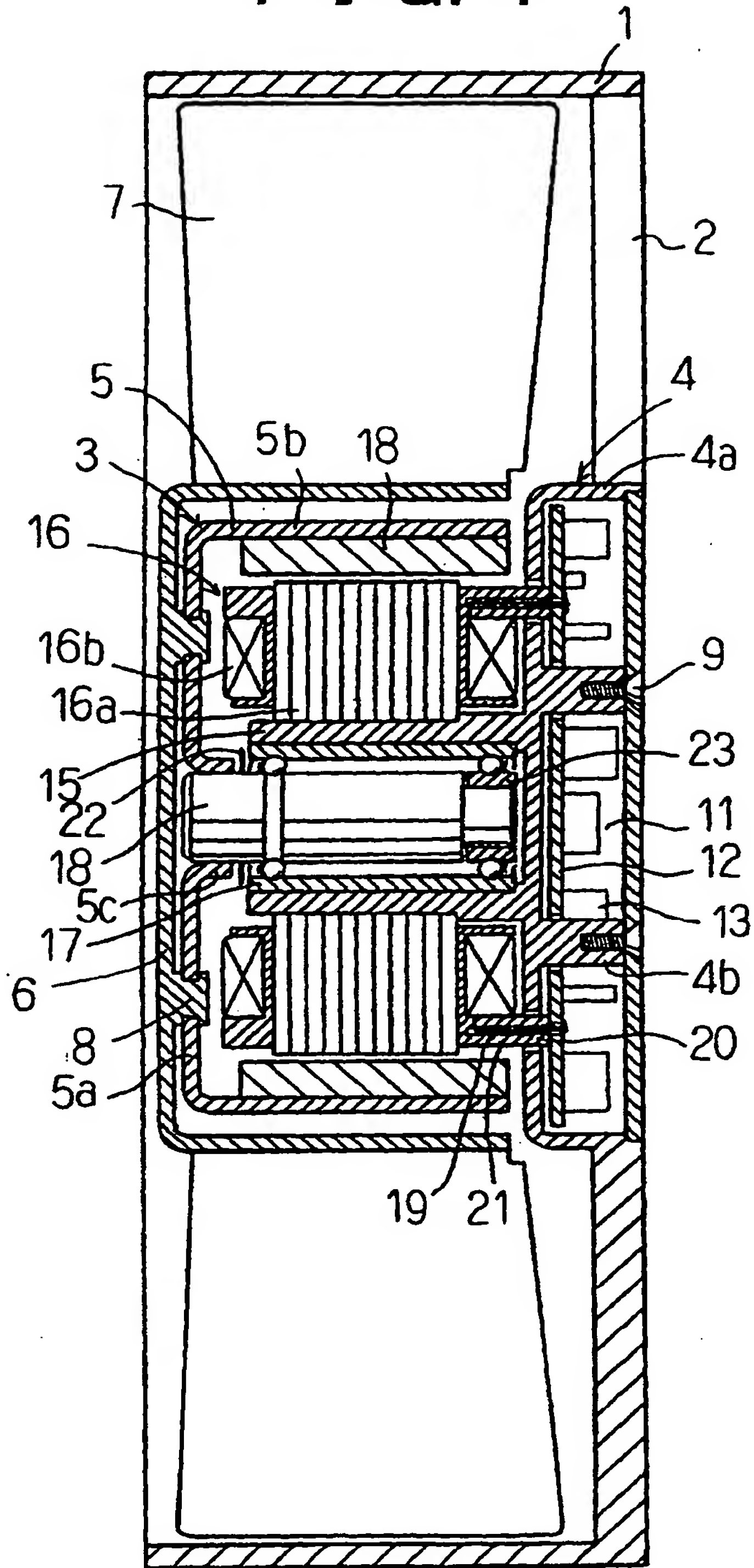


FIG. 5

